

( 3 Hours )

[ Total Marks : 80 ]

## Notes :

1. Question No **ONE** is **Compulsory**.
2. Answer any **THREE** from remaining.
3. Draw **FIGURES** wherever necessary. Figures to the right indicate full marks.
4. **WRITE** proper question / sub question numbers on the left margin allotted in answer sheet.
5. Each Question carries **EQUAL** marks.
6. **ASSUME** any additional data if necessary and state it clearly.

## 1. Attempt (Any 4)

- a) Define SVI and its significance in the context of sewage treatment? **05**
- b) The BOD of sewage for 5 days at 37°C is 360 ppm. What will be its BOD after 10 days at 20°C and 7 days at 30°C? Assume  $K_D$  at 20°C as 0.1 **05**
- c) What is the significance of the following from the point of water quality criteria also state the acceptable/desirable limit of each (IS 10500:2012)  
1) Fluorides 2) Hardness 3) Turbidity 4) Chlorides 5)MPN **05**
- d) Calculate the quantity of rain water harvested at Mumbai for a flat roof surface having tile finished area 200sqm. **05**  
Given Data-Annual rain fall of Mumbai city 2147mm  
Coefficient of roof surface=0.85  
Runoff coefficient =0.80  
Assume the required data.
- e) Explain the 5R's of municipal solid waste management. **05**

2. a) Enumerate the various types of Intake structures and discuss in details any one of them. **10**
- b) Design a sewer to serve a population of 32,000, the daily per capita water supply allowance being 150 litres of which 80 percent finds its way into the sewer. The slope available for the sewer to be laid is 1 in 625 and the sewer should be designed to carry four times the dry weather flow when running full. What would be the velocity of flow in the sewer when running full? **10**
3. a) Write the assumption for ideal sedimentation tank and prove with suitable derivation that the efficiency of sedimentation tank independent of depth of the tank. Explain the factors affecting sedimentation process. **10**
- b) Design underdrainage system of Rapid sand filter beds having dimensions 7.4m x 4.2m. Assume data wherever necessary. **10**

4. a) What is activated sludge process? Explain the following terms 1) Hydraulic retention time 2) Sludge Age 3) MLSS 4) SVI **10**
- b) Design high rate trickling filter for the following data. **10**  
Sewage flow- 6 MLD  
Recirculation ratio-1:5  
BOD<sub>5</sub> of raw sewage- 300 mg/lit.  
BOD removal in PST- 25%  
Final effluent BOD<sub>5</sub> desired - 30mg/lit.
5. a) Design septic tank for the small colony of 150 persons. **10**  
Given data  
Sewage/capita/day=130lit  
Desludging period=2 years  
Length: width=3:1.  
Explain any one method used for disposal of septic tank effluent.
- b) What are the factors affecting for self- purification of polluted streams? Draw DO sag curve. What measures would you recommend to control stream pollution in India? **10**
6. a) 1)Differentiate one pipe and two pipe system of plumbing. **10**  
2) Water softening Zeolite process
- b) 1) Effects of Air Pollution on human health and the environment **10**  
2)Break point Chlorination